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The Relationship of Body Image With Symptoms of Depression and Anxiety in Patients With Anorexia Nervosa During Outpatient Psychotherapy: Results of the ANTOP Study

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Body image disturbance represents a central characteristic of anorexia nervosa (AN). Depression and anxiety are the most common mental comorbidities in patients with AN. This study aims to investigate the relationship of body image with symptoms of depression and anxiety during outpatient psychotherapy in AN. Analyses were conducted using the data set of the Anorexia Nervosa Treatment Outpatient Study (ANTOP) randomized controlled trial. The ANTOP study included $N = 242$ females with AN between 18 and 56 years of age. The trial was designed to compare enhanced cognitive behavioral therapy (CBT-E) and focal psychodynamic therapy (FPT) with optimized treatment as usual (TAU-O) for patients with AN. The analyses on body image dimensions were conducted using measures of correlations and multiple linear regression analyses to assess the relationship and longitudinal prediction of symptoms of depression and anxiety by body image dimensions. Results showed that body image perceptions were significantly associated with symptoms of depression and anxiety in patients with AN at all treatment stages. In addition, body image dimensions at early treatment stages predict depression and anxiety in follow-up measurements. The correlation of symptoms of depression and anxiety by body image perceptions increased along treatment course. The persistence of body image disturbance, while body mass index increases under treatment (*persistency effect*), may constitute a relevant factor contributing to the course of the most common affective comorbidities of depression and anxiety in patients with AN. Body image disturbances in patients with AN should therefore be explicitly targeted within the specialized psychotherapy of affected patients.

Keywords: anorexia nervosa, body image, anxiety, depression, psychotherapy

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Anorexia nervosa (AN) causes significant psychosocial and physical impairment in affected patients and is among the mental disorders with the highest mortality (Arcelus, Mitchell, Wales, & Nielsen, 2011; Zipfel, Löwe, Reas, Deter, & Herzog, 2000). The characteristic symptoms of AN according to *DSM–IV* include significant intended weight loss through, for example, restrictive eating, underweight (body mass index, BMI < 17.5 kg/m^2), amenorrhea, fear of gaining weight, and body image disturbances (Treasure et al., 2015; Zipfel, Giel, Bulik, Hay, & Schmidt, 2015).

The disturbance of body image can be seen as a central feature of AN eventually perpetuating other pathologic AN-specific cognitions and (eating) behavior. Body image-related questions have therefore been subject of extensive research in recent decades (Bruch, 1962; Byrne et al., 2015; Cash & Grant, 1996; Keel, Dorer, Franko, Jackson, & Herzog, 2005; Mountford et al., 2015; Stice & Shaw, 2002; Waldman, Loomes, Mountford, & Tchanturia, 2013). Cash (1990) defined the general concept of body image as "the insight view," that is, the subjective experience of individuals of their own appearance. Cash and Hrabosky (2004) further described the concept as a "multifaceted psychological experience of embodiment" based on "body-related self-perceptions and self-attitudes including thoughts, beliefs, feelings, and behaviors" (Cash, 2004).

Besides the above broad definition of body image, the most common conceptualization within the field of eating disorders is described by the *dyadic taxonomy* (de Vignemont, 2010) distinguishing the (sub-) construct *body schema* from the *body image*. The term *body schema* thereby relates to the dimension of the *sensorimotor* perceptions of the body, for example, guiding body movements and enabling perceptions of the body size and its position within the environment (de Vignemont, 2010; Dijkerman & De Haan, 2007; Gallagher, 2005; Paillard, 1999; Rossetti, Rode, & Boisson, 1995). The term body image within the dyadic taxonomy describes the more emotional, qualitative appraisal of body self-perceptions (de Vignemont, 2010). In the remainder, the term *body image* is used to refer to the overall concept and not to the distinction within the dyadic taxonomy.

The highly diverse concepts related to the body image enigma have been criticized, for example, for being inconsistent and lacking systematic integral conceptualization. In light of these conceptual difficulties, the Body Image Questionnaire (BIQ-20) was developed by Clement and Löwe (1996a, 1996b) and validated in diverse clinical and population-based groups (Albani et al., 2006). The BIQ-20 seeks to overcome some of the conceptual difficulties in providing a standard bidimensional measure that enables comparable body image-related basic and clinical research across different entities (Clement & Löwe, 1996b).

Characteristic body perceptions in AN include a negative view of one's own body in general (body *image* disturbance) or the conviction of being overweight (feeling "fat") despite being severely underweight (body *schema* disturbance; Cash, 1997; Farrell, Shafran, Lee, & Fairburn, 2005; Keizer, Smeets, Dijkerman, van Elburg, & Postma, 2012; Mizes, Heffner, Madison, & Varnado-Sullivan, 2004). Current evidence suggests that the characteristic body image and body schema alterations in patients with AN show complex interactions with eating disorder-specific behavior and with symptoms of frequent comorbidities such as depression and anxiety (Brand-Gothelf, Leor, Apter, & Fennig, 2014; Bulik, 2002; Delinsky & Wilson, 2006; Hughes et al., 2013; Joos, Cabrillac, Hartmann, Wirsching, & Zeeck, 2009; Mattar, Thiébaud, Huas, Cebula, & Godart, 2012; Vocks, 2008; Vocks, Legenbauer, Wachter, Wucherer, & Kosfelder, 2007).

The ANTOP study (Zipfel et al., 2014) randomized controlled multicenter trial investigating focal psychodynamic therapy (FPT), enhanced cognitive behavioral therapy (CBT-E), and optimized treatment as usual (TAU-O) in adult outpatients with AN. The here presented analyses of the ANTOP study aim to answer the research question of how body image dimensions (measured by the BIQ; Clement & Löwe, 1996a) are associated with the outcomes of comorbid symptoms of depression and anxiety in patients with AN at different stages of outpatient psychotherapy. The latter dimensions are of importance because affective comorbidities of AN may indeed determine the course of treatment and the quality of life of patients and hence are of relevance for tailoring individual psychotherapeutic diagnostic and interventional strategies.

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It was hypothesized for the here presented analyses that body image perceptions by patients with AN would be associated with and predict the severity of symptoms of depression and anxiety. We hypothesized that the subdimension "Negative Evaluation of the Body" (NEB) of the BIQ-20 is positively associated with symptoms of depression and anxiety (i.e., the higher the values for NEB, the higher the symptom scores of anxiety and depression) and that the body image dimension (BIQ-20 subscale) "Perception of Body Dynamics" (PBD) influences symptoms of anxiety and depression negatively (i.e., the higher the scores on the PBD scale, the lower the symptom scores of depression and anxiety).

Methods

Aims and Design of the ANTOP Study

The ANTOP study represents the world-wide largest randomized controlled multicenter trial in outpatients with AN. The study evaluated the efficacy of CBT-E and focal psychodynamic psychotherapy (FPT) compared with TAU-O for outpatient treatment of adult patients with AN. The primary results of the ANTOP study have been published elsewhere (Zipfel et al., 2014). For detailed descriptions of the study design see also Wild et al. (2009). The trial was registered at http://isrctn.org, number ISRCTN72809357.

Interventions

The individual outpatient psychotherapeutic interventions, CBT-E and FPT, were based on structured treatment manuals (Fairburn, 2008; Schauenburg, Friederich, Wild, Zipfel, & Herzog, 2009). Patients received 10 months of outpatient treatment in each of the intervention arms. Study therapists received expert trainings on the respective manuals. Patients randomized to the TAU-O condition received support in seeking regular outpatient therapy with therapists who were experienced in treating patients with eating disorders. In addition, they were regularly monitored regarding body weight (BMI) and somatic course of AN by their general practitioner. See, for example, Zipfel et al. (2014) for further details on the ANTOP interventions.

Measurements and Outcomes

Interviews and questionnaire assessments were performed at five time points (t): at baseline assessment before randomization (t0); 4 months after treatment started (t1); 10 months after treatment started (end of treatment) (t2); 3 months follow-up (t3 = t2 + 3 months); and 12 months follow-up (t4 = t2 + 12 months). The BMI (body weight in kg divided by body height in m^2) at T2 was defined as primary study endpoint of the ANTOP study. Secondary outcomes included the general psychiatric and eating disorder pathology measured via, for example, the Eating Disorder Inventory-2 and the Psychiatric Status Rating (Zipfel et al., 2014).

The dimensions investigated in the here presented analyses of the ANTOP cohort are symptoms of anxiety and depression measured by the respective subscales of the Patient Health Questionnaire (PHQ; Löwe et al., 2008). The BIQ-20 was used to assess body image disturbances of patients at all measurement points (Clement & Löwe, 1996a). These instruments are briefly described in the following.

The Patient Health Questionnaire

The PHQ represents a gold-standard self-administered diagnostic instrument for a broad range of mental disorders (Löwe et al., 2008). The questionnaire is based on the *DSM–IV* diagnostic criteria and comprises subscales, for example, on anxiety, panic disorder, depression, somatoform syndromes, eating disorders, alcohol abuse, psychosocial functioning, perceived stress, and critical life events. Each of the PHQ subscales can be administered and analyzed independently. The subscales analyzed here are the subscales on depression and anxiety.

The PHQ subscale for the detection of symptoms of depression (PHQ-9) comprises nine items based on the *DSM–IV* diagnostic criteria for depression with 4-point Likert scales ranging from 0 to 3 ("*not at all*" to "*nearly every day*"). The PHQ-9 shows good validity and reliability with Cronbach's alpha of .89 (Kroenke & Spitzer, 2002; Spitzer, Kroenke, Williams, & Group, 1999). PHQ-9 sum scores range from 0 to 27 with levels of $\geq$5, $\geq$10, and $\geq$15 indicating mild, moderate, and severe depressive symptoms, respectively (Kroenke & Spitzer, 2002). Internal consistency in the ANTOP sample proved to be good with Cronbach's alpha = .84–.89 for the different measurement time points.

The PHQ subscale for the detection of symptoms of anxiety is called the "Generalized Anxiety Disorder Scale" (GAD-7) with seven items with 4-point Likert scales (Löwe et al., 2008; Spitzer, Kroenke, Williams, & Löwe, 2006). The GAD-7 shows satisfactory test properties regarding internal consistency and test–retest reliability as well as good construct, criterion, and factorial validity (Löwe et al., 2008). GAD-7 sum scores range from 0 to 21 with scores $\geq$5, $\geq$10, and $\geq$15 indicating levels of mild, moderate, and severe anxiety symptom load, respectively (Löwe et al., 2008; Spitzer et al., 2006).

The Body Image Questionnaire

The BIQ-20 was developed by Clement and Löwe (1996a) to establish a general (entity independent) measure for the assessment of cognitive-emotional body image self-appraisal. The instrument comprises 20 items divided into two subscales with 10 items each: PBD and NEB (Clement & Löwe, 1996a). The subscale NEB describes negative attitudes toward one's own body, a missing cognitive-emotional sense of bodily coherence and body-related well-being (higher NEB scores indicating larger extents of body image disturbance; item examples: "I am dissatisfied with my body"; "sometimes I feel disgust towards myself"; "I do not like myself in photographs"; Clement & Löwe, 1996a). The subscale PBD represents a "sense of energy and healthiness" and the evaluation of body-related activities or dimensions (lower PBD scores indicating larger extents of body image disturbance) such as dancing or sexuality (item examples: "In general, I feel robust and strong"; "I am healthy"; "I feel at home in my body"; Clement & Löwe, 1996a). The BIQ-20 subscales have been validated within diverse samples of healthy and diseased populations showing good psychometric properties (see, e.g., Albani et al., 2006; Clement & Löwe, 1996a). Internal consistencies for the two subscales are reported with Cronbach's alpha of .84 for the subscale NEB and

.91 for the subscale PBD (Albani et al., 2006). Internal consistencies in the ANTOP sample proved to be good to excellent with Cronbach's alpha = .87–.93 for the NEB subscale and Cronbach's alpha = .83–.92 for the PBD subscale.

Statistical Analyses

For sample descriptions, means, percentages, and distributions are reported. For the analysis of differences in means, analyses of variance for repeated measures were applied. If sphericity was violated, corrections according to Greenhouse Geisser are reported. To test for (cross-sectional) correlations of determinants (body image constructs) with the respective outcome dimensions (affective states), Spearman rho test was applied as a nonparametric measure because normal distribution was not consistently fulfilled for all outcome dimensions at every time point. The level of significance for all analyses was set at $\alpha = .05$.

Multiple linear regression analyses were performed to assess whether the BIQ-20 sum-scores for NEB and PBD at t0 to t4—or their respective change scores—were associated (cross-sectionally) or predicted (longitudinally) the outcomes anxiety and depression at the individual measurement. Longitudinal models analyses were adjusted for BMI at baseline. In a second step, longitudinal models analyses were additionally adjusted by the respective outcome dimension (depression and anxiety) at baseline. All statistical analyses were performed using IBM SPSS Statistics version 21.

Results

The ANTOP study cohort comprises $N = 242$ females between 18 and 56 years of age. For an overview of the baseline sample characteristics see Table 1.

For an overview of the means and standard deviations of all variables used in the analyses at each time point, see Table 2.

The significant main effects of measurement time point for the BIQ-20 subscales (NEB: $F(3, 454) = 30.45$, $p < .001$, $\eta^2 = .175$; PBD: $F(3, 446) = 34.03$, $p < .001$, $\eta^2 = .191$) and for the PHQ subscales (depression: $F(4, 519) = 22.44$, $p < .001$, $\eta^2 = .135$; anxiety: $F(4, 576) = 27.76$, $p < .001$, $\eta^2 = .162$) show that all included dimensions change significantly (in expected directions) over the course of the study. The PBD subscale scores thereby significantly increased over the course of the study whereas the scores of NEB decreased—which means that the patients improved in PBD as well as in NEB. As expected, PHQ-9 and GAD-7 scores decreased significantly with therapy duration. Changes did not differ systematically across treatment arms (CBT-E, FPT, TAU-O).

All cross-sectional correlations between PBD and NEB at the one hand and depression and anxiety severity at the other hand proved to be significant. The correlation coefficients were increasing from baseline until the end of treatment with peaks either at t2 (end of treatment) or t3 (3-month follow-up) and somewhat less strong correlations at subsequent measurement points (see Figures 1 and 2).

Table 1
Baseline Characteristics of The ANTOP Cohort

Sample size	$N = 242$
Demographic characteristics	
Mean (*SD*) age at entry (years)	27.74 (8.2)
Marital status	
Single, never married	197 (81%)
Married, or living as such	32 (13%)
Separated or divorced	11 (5%)
Unknown	2 (1%)
Clinical characteristics	
Mean (*SD*) weight (kg)	46.47 (4.2)
Mean (*SD*) body mass index (kg/m^2)	16.71 (1.0)
Body-mass index	
<17·5 kg/m^2	171 (71%)
17·5 to ≤ 18·5 kg/m^2	71 (29%)
Duration of illness	
≤6 years	148 (61%)
>6 years	94 (39%)
Anorexia nervosa subtypes	
Binge-purge	111 (46%)
Restrictive	131 (54%)
Comorbidities	
Affective disorder	58 (24%)
Anxiety disorder	59 (24%)
Somatoform disorder	5 (2%)
Substance abuse	0
Mean (*SD*) total score on the eating disorder inventory	268 (53.6)
Mean (*SD*) total score on the structured inventory for anorexic and bulimic syndromes	1.1 (.3)
Mean (*SD*) total score of the subscale depression of the patient health questionnaire	10.5 (5.4)
Mean (*SD*) total score of the subscale anxiety of the patient health questionnaire	7.9 (4.7)
Mean (*SD*) total score of the subscale stress of the patient health questionnaire	7.3 (3.5)

Note. Data are mean (*SD*) or number of patients (%).

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Table 2
Descriptives of Analyzed Outcomes and Determinants

	Measurement time points				
	t0 *M* (*SD*)	t1 *M* (*SD*)	t2 *M* (*SD*)	t3 *M* (*SD*)	t4 *M* (*SD*)
PHQ					
Depression	10.51 (5.43)	10.34 (5.54)	8.72 (5.92)	8.43 (5.61)	7.31 (5.63)
Anxiety	7.90 (4.71)	8.37 (4.74)	6.28 (4.70)	6.47 (4.60)	5.26 (4.12)
BIQ					
NEB	33.75 (8.18)	33.18 (8.66)	30.53 (9.55)	29.88 (9.94)	28.75 (9.57)
PBD	26.80 (7.09)	27.72 (6.97)	29.45 (7.48)	30.43 (7.96)	31.41 (7.68)

Note. PHQ = Patient Health Questionnaire; BIQ = Body Image Questionnaire; NEB = Negative Evaluation of the Body; PBD = Perception of Body Dynamics; *M* = mean; *SD* = standard deviation; for the BMI scores at the respective measurement time points, see Zipfel et al. (2014).

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Multiple linear regression analyses were performed to assess to what extent BIQ-20 subscale scores explain the variance of symptom loads of depression (PHQ-9) and anxiety (GAD-7; cross-sectional) at each measurement point. For a complete account of the cross-sectional regression models see Table 3. All of the regression models showed significant variance explanation for both outcome dimensions by the combination of NEB and PBD. Durbin-Watson statistics and Tolerance values proved to be good to very good.

To analyze whether BIQ-20 subscale scores at baseline and early within treatment time points predict symptoms of depression and anxiety at 12-month follow up, multiple linear regression analyses were performed. BMI was included as control variable. Total explanation of variance of affective outcomes at t4 (12-months follow-up) by Body Image perceptions (BIQ-20 subscales) and BMI at t0 (baseline) were $R^2 = 0.10$ ($p < .001$) for depressive symptoms and $R^2 = 0.06$ ($p < .05$) for symptoms of anxiety. The prediction of affective outcomes at t4 by Body Image perceptions and BMI at t1 (4 months in treatment) showed variance explanations of $R^2 = 0.15$ for depression ($p < .001$) and $R^2 = 0.10$ ($p < .001$) for anxiety. Comparing the individual contributions of variance for single factors, standardized β values in the latter models were the highest for the BIQ subscale of NEB with β values ranging from .27 to .31 for both dependent variables (depression and anxiety). Testing the prediction of change scores (improvement) of (a) depression and (b) anxiety (delta t4 minus t1, respectively) by body image perceptions at t1, the BIQ subscale PBD showed the highest single variance contributions both for the relative improvements of depression (standardized β = .30, $p < .05$) and anxiety (standardized β = .24, $p < .05$) when compared with the included factors of NEB and BMI (see Table 4).

Including the respective outcome (depression or anxiety) as further control variable in the longitudinal model analyses led to the following model outcomes. Total variance explanation of affective outcomes at t4 (12-month follow-up) by Body Image perceptions (BIQ-20 subscales), depression or anxiety at t0 and BMI at t0 (baseline) were $R^2 = 0.15$ ($p < .001$) for depressive symptoms and $R^2 = 0.22$ ($p < .05$) for symptoms of anxiety. For both models, the PHQ score of the respective subscale at baseline was a significant predictor (depression: standardized β = .29; anxiety: standardized β = .45). The NEB subscale at t0 remained a significant predictor for depression at t4 whereas there was only a trend for a prediction of NEB at t0 for anxiety at t4. NEB t1 did not predict depression or anxiety at t4 significantly, nor was there a prediction of depression or anxiety change scores (delta t4–t0) if either depression or anxiety at baseline was included as control variable.

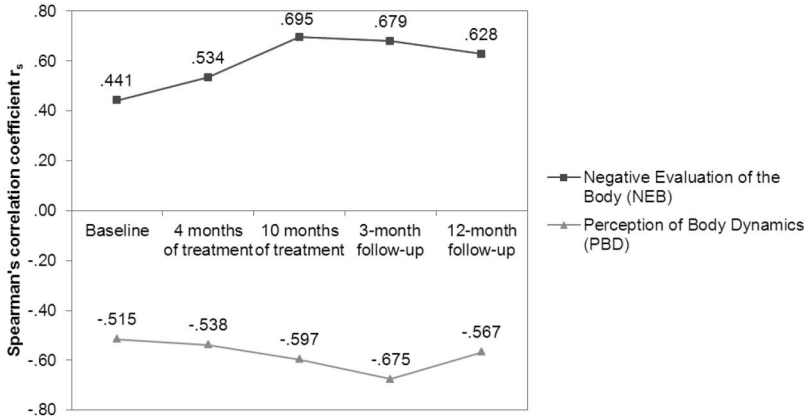

Figure 1. Association of BIQ-20 subscales with symptoms of depression (PHQ-9).

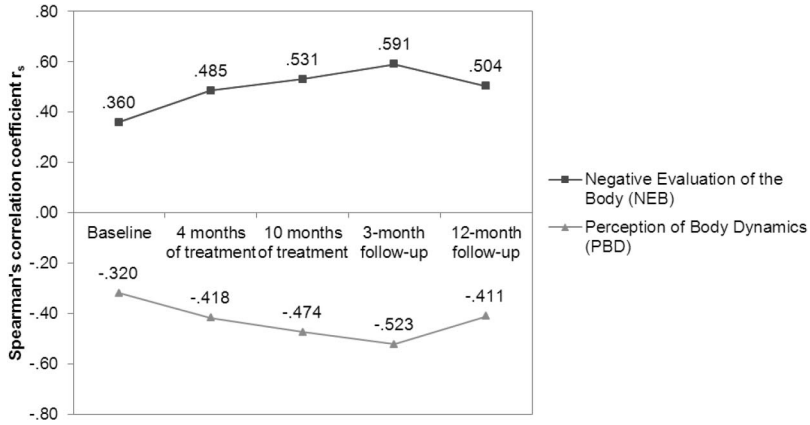

Figure 2. Association of BIQ-20 subscales with symptoms of anxiety (PHQ GAD-7).

Discussion

Main Findings

The results of these analyses of the ANTOP cohort show that body image perceptions in patients with AN measured by the BIQ-20 are strongly associated with symptoms of depression and anxiety at all stages of a 10-month individual outpatient psychotherapy independent of the form of treatment (CBT-E, FPT, or TAU-O). The associations of body image perceptions with symptoms of depression and anxiety appeared to increase along the course of treatment despite overall improvement of depression, anxiety, and body image disturbances with treatment duration. Furthermore, body image perceptions are substantially associated (cross-sectional) with the variance of symptoms of depression and anxiety at all measurement time points. Again, variance explanation in cross-sectional models was shown to be the highest at late

Table 3
Regression Models for the Cross-Sectional Determination of Symptoms of Depression and Anxiety by BIQ-Subscales Across Measurement Points

	PHQ subscale depression						PHQ subscale anxiety (GAD-7)					
	N	*b* (95% CI)	*SE* b	β	*p*	Tolerance	*N*	*b* (95% CI)	*SE* b	β	*p*	Tolerance
t0	242						242					
Constant		11.71 (7.77, 15.66)	2.00		<.001			5.73 (1.89, 9.58)	1.95		.004	
NEB t0		0.20 (0.13, 0.28)	0.04	.31	<.001	.879		0.17 (0.10, 0.24)	0.04	.29	<.001	.879
PBD t0		−0.30 (−0.39, −0.22)	0.04	−.40	<.001	.879		−0.13 (−0.21, −0.05)	0.04	−.20	.002	.879
Adjusted R^2	.33*						.16*					
t1	210						210					
Constant		11.84 (7.54, 16.14)	2.18		<.001			6.79 (2.71, 10.87)	2.07		.001	
NEB t1		0.23 (0.15, 0.30)	0.04	.35	<.001	.812		0.20 (0.13, 2.70)	0.04	.36	<.001	.812
PBD t1		−0.32 (−0.42, −0.23)	0.05	−.41	<.001	.812		−0.18 (−0.27, −0.09)	0.05	−.26	<.001	.812
Adjusted R^2	.41*						.27*					
t2	186						186					
Constant		6.79 (1.62, 11.97)	2.62		.010			4.51 (−0.08, 9.09)	2.33		.054	
NEB t2		0.28 (0.20, 0.36)	0.04	.45	<.001	.650		0.19 (0.12, 0.27)	0.04	.39	<.001	.650
PBD t2		−0.23 (−0.33, −0.12)	0.06	−.28	<.001	.650		−0.14 (−0.23, −0.04)	0.05	−.22	.005	.650
Adjusted R^2	.43*						.29*					
t3	171						171					
Constant		11.12 (6.68, 1556)	2.25		<.001			6.71 (2.41, 11.00)	2.18		.002	
NEB t3		0.22 (0.15, 0.30)	0.04	.40	<.001	.627		0.17 (0.11, 0.24)	0.04	.38	<.001	.627
PBD t3		−.31 (−.40, −.22)	0.05	−.44	<.001	.627		−0.18 (−0.27, −0.09)	0.04	−.31	<.001	.627
Adjusted R^2	.55*						.38*					
t4	164						164					
Constant		12.26 (7.11, 17.41)	2.61		<.001			5.39 (.87, 9.88)	2.28		.020	
NEB t4		0.19 (0.11, 0.27)	0.04	.32	<.001	.622		0.14 (0.07, 0.21)	0.04	.33	<.001	.622
PBD t4		−0.33 (−0.44, −0.23)	0.05	−.45	<.001	.622		−0.13 (−0.22, −0.04)	0.05	−.25	.004	.622
Adjusted R^2	.48*						.26*					

Note. PHQ = Patient Health Questionnaire; NEB = Negative Evaluation of the Body; PBD = Perception of Body Dynamics; Outcomes for each regression model are the PHQ subscales for the corresponding measurement time point. Decreasing *N* due to drop-out to subsequent time points or missing data on investigated dimensions.
* $p < .05$.

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Table 4
Regression Models for the Prediction of Symptoms of Depression and Anxiety by BIQ-Subscales

	PHQ subscale depression						PHQ subscale anxiety (GAD-7)					
	N	*b* (95% CI)	*SE* b	β	*p*	Tolerance	*N*	*b* (95% CI)	*SE* b	β	*p*	Tolerance
t4	166						166					
Constant		5.58 (−9.30, 20.46)	7.54		.187			0.43 (−10.68, 11.54)	5.63		.939	
NEB t0		0.19 (0.08, 0.30)	0.06	.27	.001	.886		0.14 (0.06, 0.22)	0.04	.27	.001	.886
PBD t0		−0.11 (−0.24, 0.017)	0.07	−.13	.086	.885		−0.00 (−0.10, 0.09)	0.05	−.01	.943	.885
BMI t0		−0.09 (−0.92, 0.74)	0.42	−.02	.823	.998		0.01 (−0.61, 0.63)	0.31	.00	.969	.998
Adjusted R^2	.10**						.06*					
t4	159						159					
Constant		11.67 (0.08, 23.25)	5.87		.048			4.92 (−3.76, 13.60)	4.39		.264	
NEB t1		0.20 (0.09, 0.30)	0.06	.29	<.001	.855		0.15 (0.07, 0.23)	0.04	.31	<.001	.855
PBD t1		−0.13 (−0.26, 0.01)	0.07	−.15	.062	.829		−0.03 (−0.13, 0.07)	0.05	−.05	.513	.829
BMI t1		−0.43 (−1.05, 0.18)	0.31	−.11	.165	.956		−0.22 (−0.68, 0.24)	0.23	−.07	.340	.956
Adjusted R^2	.15**						.10**					
Δ t4-t1	159						159					
Constant		4.97 (−6.37, 16.31)	5.74		.388			3.29 (−5.81, 12.39)	4.61		.477	
NEB t1		−0.02 (−0.13, 0.08)	0.06	−.04	.661	.855		−0.06 (−0.14, 0.02)	0.04	−.12	.156	.855
PBD t1		0.23 (0.10, 0.36)	0.07	.30	.001	.829		0.15 (0.05, 0.25)	0.05	.24	.004	.829
BMI t1		−0.79 (−1.39, −0.19)	0.30	−.20	.010	.956		−0.50 (−0.98, −0.01)	0.24	−.16	.044	.956
Adjusted R^2	.09**						.08**					

* $p < .05$. ** $p < .001$.

stages within therapy and seemed to "wash out" to some extent toward follow-up measurements. In addition, body image perceptions at baseline and early stages of outpatient therapy predicted symptoms of depression and anxiety at 12 months posttherapy (in longitudinal models adjusted for BMI). Including the dependent variables depression or anxiety as control variable in the longitudinal model analyses results confirmed NEB at baseline as a significant predictor of depression at 12-month follow-up.

Interpretation of Results

The above presented findings confirm the dimension of body image to play a central role, not only as specific diagnostic criteria of AN, but as a potential factor eventually contributing to affective comorbidity. The association with symptoms of depression thereby was found to be consistently larger than the association of body image dimensions with symptoms of anxiety. The correlations and explanations of variance of symptoms of depression and anxiety by body image perceptions thereby seem to follow a systematic pattern across measurement time points. Both relationships (body image and depression and body image and anxiety) thereby show increasing correlation coefficients toward the end of treatment.

The latter finding may be cautiously interpreted as being potentially indicative of a phenomenon that is here described as a *persistency effect* in AN. This effect may delineate that the persistence of disease-specific cognitions such as body image disturbance (body schema disturbance) may, for example, be increasingly excruciating (and hence, e.g., depressing) for patients if treatment progress is made in the dimension of weight gain. The dilemma of persistent (or augmented) agonizing anorectic cognitions such as, for example, NEB, may thereby be all the more relevant, the higher the body weight (BMI) becomes. If such a *persistency effect* exists in patients with AN, it might be a relevant factor in the course of affective comorbidity in patients with AN (Brand-Gothelf et al., 2014; Bulik, 2002; Bulik, Sullivan, Fear, & Joyce, 1997; Hughes et al., 2013; Mattar et al., 2012; Vocks et al., 2007; Vocks, Wachter, Wucherer, & Kosfelder, 2008). Furthermore, given the potentially *affect phobic* or (emotional) conflict avoiding nature of AN (Jansch, Harmer, & Cooper, 2009; Joos et al., 2009) and the phenomenon of decreasing intensity in the perception of (negative) affects in states of (significant) underweight, the affective comorbidity owing to the *persistency effect* may constitute a potential risk factor, for example, relapse and chronicity in AN.

However, the finding that the association of body image perception with symptoms of depression and anxiety seems to decrease following the end of treatment, may contradict the above described consequences, given that patients in the ANTOP cohort overall gained body weight between the end of treatment and 12-month follow-up. This may point to psychotherapy itself as a potential moderating factor between body image-related cognitions, weight gain, and affective symptoms in patients with AN. It can be assumed that the (verbal) confrontation with and reflection of disease-specific cognitions, such as body image disturbance together with weight gain in psychotherapeutic sessions, does stipulate the conscious perception of potentially associated conflicts and hence may increase the affective burden of patients.

Such hypothesis may be supported also by the finding that the ratings for body image disturbances as well as for symptoms of depression and anxiety were found to be higher at t1 (4 months after treatment) compared with t0 (baseline).

While the activation of internal conflicts and related affects as well as their conscious reflection may be seen as a fundamental prerequisite of psychotherapeutic processes (Foa & Kozak, 1986), the question remains, what therapeutic strategies and techniques are best suited to address body image disturbances, related cognitions, and affective dimensions in patients with AN. Over past decades numerous specific treatment manuals, modules, and techniques for the treatment of body image disturbances have been

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proposed and partially evaluated in diverse settings (e.g., individual, group, and self-help settings; Bhatnagar, Wisniewski, Solomon, & Heinberg, 2013; Cash, 1997, 2002; Delinsky & Wilson, 2006; Farrell, Lee, & Shafran, 2005; Fernández & Vandereycken, 1994; Fisher & Thompson, 1994; Grant & Cash, 1996; Hilbert, Tuschen-Caffier, & Vögele, 2002; Key et al., 2002; Marco, Perpiñá, & Botella, 2013; Mountford et al., 2015; Rosen, 1997; Rosen, Saltzberg, & Srebnik, 1989; Tuschen-Caffier, Vögele, Bracht, & Hilbert, 2003; Vocks, 2008; Vocks et al., 2007). The most widely adopted strategies are cognitive–behavioral (CBT) approaches including techniques such as cognitive restructuring, mirror exposure, video-confrontation, and virtual reality.

The available reviews of the literature on body image-related interventions, however, conclude that there are mixed findings with regards to, for example, mechanisms and clinical implications and many promising first results for the diverse attempts have not been replicated consistently (Farrell, Shafran, & Lee, 2006; Jarry & Berardi, 2004).

More recent evidence on the other hand seems to underline the importance of body image as an explicit treatment target in specialized psychotherapy for patients with eating disorders. Vocks et al. (2007), for example, showed that body exposure therapy (via mirror exposure) in patients with AN and bulimia nervosa (BN) may reduce negative body-related emotions and cognitions significantly. The authors thereby reported larger effects for alterations of negative emotions than for cognitions (Vocks et al., 2007). Hilbert et al. (2002) found similar results for individuals with binge-eating disorder (BED) where mirror exposure improved negative mood, appearance self-esteem, and frequencies of negative cognitions in individuals with BED (Hilbert et al., 2002; Jansen et al., 2008). Delinsky and Wilson (2006) reported improvements in body checking and avoidance, weight and shape concerns, body dissatisfaction, dieting, depression, and self-esteem through a manualized mirror exposure intervention.

Given these insights of the current literature and the findings of the here presented analyses, it may seem promising to emphasize the explicit diagnostic and therapeutic targeting of body image-related cognitions and emotions in patients with AN as a central part of specialized psychotherapeutic strategies (see Table 5 for exemplary CBT and FPT techniques to address body image disturbance in patients with AN). The findings of this study may imply that the assessment of body image disturbance in patients with AN should be made on a regular basis (using, e.g., in-session explorations or validated self-report instruments) along the treatment process to analyze the risk or extent of body image-related affective (depressive) burden and to adjust, for example, treatment duration and content accordingly. Regarding the differential indications of therapeutic techniques such as mirror exposure or video-confrontation, further evidence is urgently needed to allow conclusive recommendations for psychotherapeutic practices.

Limitations

While the ANTOP study design and the conduct of the study were based on the highest international standards of clinical research, the results of these analyses of the ANTOP cohort have to be interpreted with caution. One limitation may be that the subscales of the BIQ-20 as independent factors, from a theoretical perspective, cannot be seen as fully independent constructs from, for example, the core characteristics of the, for example, dependent variable symptoms of depression. However, for example, the central finding of systematically and relatively changing explanations of variance of affective symptoms by body image dimensions across measurement time points, can be seen as independent from such potential limitations. Furthermore, the direction of the investigated relationships may potentially be bidirectional, that is, depressive symptoms may indeed lead to less positively perceived body image. From a clinical perspective, however, the inference of

Table 5
Exemplary Interventions to Address Body Image in Patients With Anorexia Nervosa

Exemplary CBT-based interventions to address body image in patients with AN	
Specific aims	To provide information on the four components of body image (perception, cognitions, emotions and behavior) To improve the perceptive and emotional / cognitive aspects of body image
Procedures	Explaining the four-component model to the patient Analyzing the patient's attitudes toward her own body Identifying possible discrepancies between external and self-perception with the help of body awareness techniques (e.g. "body journey," cognitive restructuring: "I am feeling fat." – "What else am I feeling?")

Note. According to Fairburn (2008) mirror exposures are not recommended as focusing on the own reflection in the mirror may reinforce the disturbed self-perception. Instead, the use of mirrors should be explored intensively (frequency, purpose, rituals, etc.; see e.g. Fairburn, 2008 for further reading). See e.g. Friederich, Herzog, Wild, Zipfel, & Schauenburg (2014).

Exemplary FPT-based interventions to address body image in patients with AN	
Specific aims	Developing an empathic and friendly relationship with the body Reduction of self-destructive body related emotions, cognitions and behavior
Procedures	Body perception exercises Integration of perception of body expression, body movements, breathing and other body sensations into the therapeutic process Imagination exercises on the perception of patient's body-self in dependence on patient's current emotional state Improving mentalization of body-related perceptions (e.g. "if your body could talk what would it say?") Careful symbolic interpretations of the role of body and body image related to, e.g., inner conflicts

See e.g. Friederich, et al. (2014).

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more explicit addressing of the interactions of body image and the affective burden of patients can be inferred irrespective of the relative importance of either factor or direction of influence. Another, more general, limitation may lie in the fact that the outcomes and determinants incorporated in the analyses were all based on self-report questionnaires and not on structured interviews or objective measures and hence, the extent of, for example, correlations might be overestimated in the results.

A final remark regarding potential limitations has to be made with regards to the role of body image dimensions within the ANTOP treatment manuals. Given rather inconclusive evidence on the matter, specific body image-related interventions have not been a central part of the treatment manuals applied in the ANTOP study. In both the CBT-E and the FPT manuals used in the ANTOP study, a facultative basic module on body image was offered for application by study therapists (see Table 5). However, the modules were rarely applied by therapists because the compulsory parts of, for example, the CBT-E treatment represented a comprehensive set of modules given the ANTOP treatment duration of 10 months. This may also explain that there have not been systematic variations across different treatment modalities related to the body image subscales.

Conclusion

Body image perceptions measured by the BIQ-20 are significantly associated with and predict symptoms of depression and anxiety in patients with AN. A *persistency effect* describing the potential dilemma of longevity of body image disturbance while body weight increases under treatment, may be a specific factor contributing to the course of the most common affective comorbidities of depression and anxiety in patients with AN. Cognitions and affective states related to body image disturbances in patients with AN seem promising therapeutic targets in the specialized psychotherapy of patients with AN. Given mixed evidence on specific body image-related therapeutic techniques, further prospective and controlled clinical research is urgently needed to foster the understanding of mechanisms and further improvement of psychotherapeutic practice.

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